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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/690,401

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EXAMINER

TRUONG, CAM Y T

ART UNIT

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/690,401	<b>Applicant(s)</b> DIAMENT, BENJAMIN JAY	
	<b>Examiner</b> Cam Y T. Truong	<b>Art Unit</b> 2169	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,13,15-18,25,27-30 and 37-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-6,13,15-18,25,27-30 and 37-48 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. Applicant has amended claim 25 in the amendment filed on 12/10/2007.

Claims 1, 3-6, 13, 15-18, 25, 27-30 and 37-48 are pending in this Office Action.

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1, 3-6, 13, 15-18, 25, 27-30 and 37-48 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 3-4, 13, 15, 16, 25, 27-28, 37, 39, 41, 43, 45, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Introduction to Languages, Machines and Logic, Alan P. Parkes (or hereinafter "Alan"), 2002.

As to claim 1, Matsuda teaches the claimed limitations:

“at a search engine having one or more processors and memory, the memory of the search engine storing one or more programs to be executed by the one or more processors of the search engine” as (paragraphs 0021-0023);

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“receiving a number-range search query having a number range, wherein the number range includes a boundary number” as processing a query have a condition of price  $>10$ . 10 is represented as one boundary number (paragraph [0047]);

“generating an expression of numerical index terms based on the boundary number” as transforming query to an equivalence search using an inverted index generated, e.g., the exemplary query is simple query having a single search condition. For two numbers N and M, their tokens  $N_i$  and  $M_i$ , if  $N.M$  there exists, by definition, a token  $N_j$  which is greater than  $M_j$ . In this case, the transformed query has an index entry that includes attribute, token, list). The transformed query is based on number 10 (paragraph [0047, 0048, 0049], page 4, col. Right, lines 49-52),

“wherein a respective numerical index term in the expression includes information indicative of an integral portion of a logarithm of the boundary number” as each index entry includes each token associated with an indexed number, e.g., token 0001 is associated with index 5 (page 4, col. Right, lines 49-52; fig. 5); as index term 01, 001, 0001 in table 1 includes a 1 bit in certain positions of the binary number indicates only numeric values that are greater than 10 (paragraphs 0051, 0047, 0048). The above information shows that expression includes information indicative of a portion of the boundary number, but not information indicative of an integral portion of a logarithm of the boundary number;

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“searching a document index using the expression to identify one or more document containing numbers that satisfy the expression” as returning to the search condition, document Ids are retrieved from each matching token index which results in an ID list of all documents that match those tokens (paragraph [0052]);

“returning a result in accordance with at least a subset of the identified documents” as (paragraph 0052, page 20, col. Right).

Matsuda does not explicitly teach the claimed limitation “information indicative of an integral portion of a logarithm of the boundary number”.

Alan teaches log 10 of a number. For example log 10 of number 1000:  
 $1000/10 = 100$ -step 1  
 $100/10 = 10$ -step 2  
 $10/10 = 1$ -step 3. log 10 100 is approximately 3 (page 259-261).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Alan’s teaching of a logarithm of boundary number to Matsuda’s system in order to process a query having multiple ranges more efficiently and further eliminate processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

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As to claims 3, 15, 27, Matsuda teaches the claimed limitation “wherein at least one numerical index term in the expression includes information indicating that a specified digit is the last non-zero digit of a respective number” as (fig. 5, page 4, col. Right, lines 49-52, paragraph [0042]).

As to claims 4, 16, 28, Matsuda teaches the claimed limitation “wherein at least one numerical index term in the expression includes information indicative of the sign of a respective number” as (fig. 5, page 4, col. Right, lines 49-52, paragraph [0042]).

Claim 13 is rejected under same reason as discussed in claim 1, Matsuda further teaches "a computer-readable medium having stored thereon instructions which, when executed by a processor, cause the processor to perform the operation of" (paragraphs 0021-0023).

As to claim 25, Matsuda teaches a search engine for querying number range searches (paragraphs 0052):

“one or more servers, each having one or more processors and memory, the memory of the one or more servers storing one or more programs to be executed by the one or more processors of the one or more servers” as (paragraph 0021, 0023): “the one or more programs including: a query-encoder configured to receive a search query for a number range having a boundary number,” as processing a query have a condition of price >10. 10

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is represented as one boundary number. The above information indicates that the system has included a query-encoder to receive the query and process the query (paragraph [0047]);

“wherein the query encoder is configured to generate an expression of numerical index terms based on the boundary number,” as transforming query to an equivalence search using an inverted index generated, e.g., the exemplary query is simple query having a single search condition. For two numbers N and M, their tokens  $N_i$  and  $M_i$ , if  $N.M$  there exists, by definition, a token  $N_j$  which is greater than  $M_j$ . In this case, the transformed query has an index entry that includes attribute, token, list). The transformed query is based on number 10 (paragraph [0047, 0048, 0049], page 4, col. Right, lines 49-52),

“wherein a respective numerical index term in the expression includes information” as index term 01, 001, 0001 in table 1 includes a 1 bit in certain positions of the binary number indicates only numeric values that are greater than 10 (paragraphs 0051, 0047, 0048). Each index entry includes each token associated with an indexed number, e.g., token 0001 is associated with index 5 (page 4, col. Right, lines 49-52; fig. 5);

“an index searcher coupled to the query encoder and configured to search a document index using the expression to identify one or more document containing numbers that satisfy the expression” as returning to the search

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condition, document IDs are retrieved from each matching token index which results in an ID list of all documents that match those tokens (paragraph [0052]),

“ to return a result in accordance with at least a subset of the identified documents” as (paragraph 0052, page 20, col. Right).

Matsuda does not explicitly teach the claimed limitation “indicative of an integral portion of a logarithm of the boundary number”.

Alan teaches log 10 of a number. For example log 10 of number 1000:  
 $1000/10 = 100$ -step 1  
 $100/10 = 10$ -step 2  
 $10/10 = 1$ -step 3. log 10 100 is approximately 3 (page 259-261).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Alan's teaching of a logarithm of boundary number to Matsuda's system in order to process a query having multiple ranges more efficiently and further eliminate processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

As to claims 37, 41 and 45, Matsuda does not explicitly teach the claimed limitation “wherein a respective numerical index term in the expression represents a respective digit of a respective number in base 10”.

Alan teaches log 10 of a number. For example log 10 of number 1000:



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$1000/10 = 100$ -step 1

$100/10 = 10$ -step 2

$10/10 = 1$ -step 3.  $\log_{10} 100$  is approximately 3 (page 259-261).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Alan's teaching of a logarithm of boundary number to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database, process a query having multiple ranges more efficiently, reduce processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values

As to claims 39, 43 and 47, Matsuda does not explicitly teach the claimed limitation "wherein the integral portion of the logarithm of a respective boundary number is an integral portion of a base 10 logarithm of the respective boundary number".

Alan teaches  $\log_{10}$  of a number. For example  $\log_{10}$  of number 1000:

$1000/10 = 100$ -step 1

$100/10 = 10$ -step 2

$10/10 = 1$ -step 3.  $\log_{10} 100$  is approximately 3 (page 259-261).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Alan's teaching of a logarithm of

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boundary number to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database, process a query having multiple ranges more efficiently, reduce processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

7. Claims 5, 17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Alan and further in view of Lewak et al (or hereinafter "Lewak") (US 6826566).

As to claims 5, 17 and 29, Matsuda does not explicitly teach the claimed limitation "wherein at least one numerical index term includes information indicative of a number type associated with a respective number range".

Lewak teaches value types includes numbers and dates (col. 12, lines 8-10).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Lewak's teaching of value types includes numbers and dates to Matsuda's system in order to allow a user to select a specific number type for searching so that the speed of query responses quickly.

8. Claims 6, 18, 30, 38, 42 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Alan and further in view of Burrows.

As to claims 6, 18 and 30, Matsuda does not explicitly teach the claimed limitation “wherein the expression includes a plurality of numerical index terms that each correspond to a single respective digit of a respective number”. Burrows teaches index terms that corresponding to a digit of a range number (fig. 7, col. 26, lines 1-30).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows’s teaching of index terms that corresponding to a digit of a range number to Matsuda’s system in order to identify locations of the records including portions of numeric information within the span of the range of values.

As to claims 38, 42 and 46, Matsuda does not explicitly teach the claimed limitation “wherein the respective numerical index term in the expression corresponds to the position of the respective digit within the respective number”.

Burrows teaches index terms that corresponding to the position of a digit of a range number (fig. 7, col. 26, lines 1-30).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows’s teaching of index terms that corresponding to the position of a digit of a range number to Matsuda’s

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system in order to identify locations of the records including portions of numeric information within the span of the range of values.

9. Claims 40, 44, 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Alan and further in view of Beavin et al (or hereinafter "Beavin") (US 6571233).

As to claims 40, 44 and 48, Matsuda does not explicitly teach the claimed limitation " wherein a respective numerical index term in the expression includes information indicative of a mantissa of a respective number".

Beavin teaches decimal number 270 refers to numbers in base 10 (col. 4, lines 62-65)

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Beavin's teaching of decimal number 270 refers to numbers in base 10 to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database.

**Contact Information**

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cam Y T. Truong whose telephone number is (571) 272-4042. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tony Mahmoudi can be reached on (571) 272-4078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Cam Y Truong/  
Primary Examiner, Art Unit 2169

